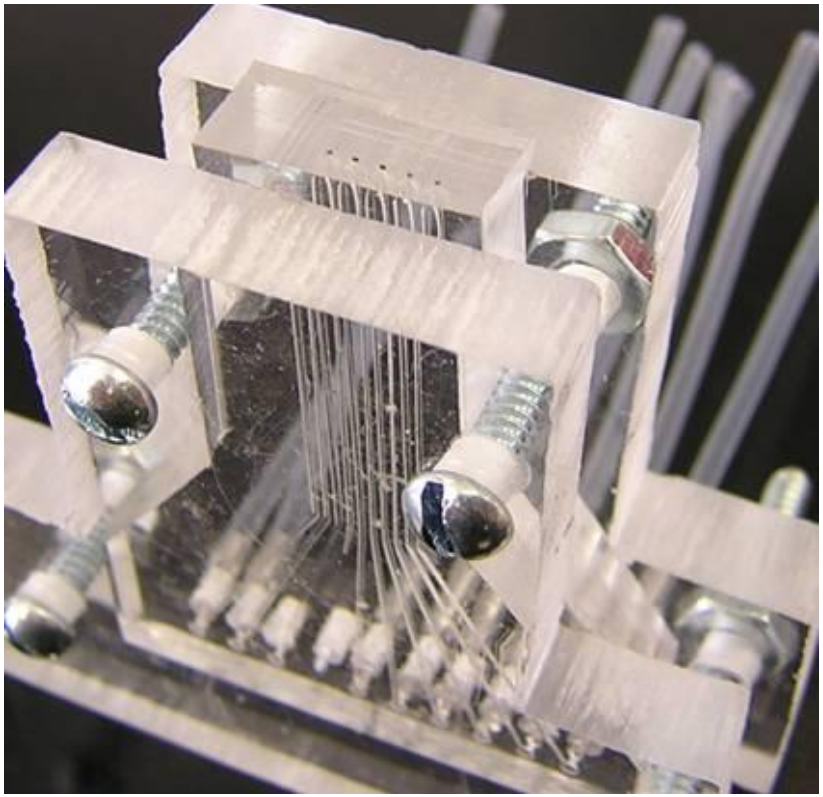
Utah State Center of Excellence in

Biomedical Microfluidics



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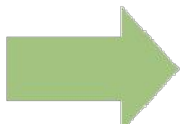
Proteomics:

Next Step Beyond the Human Genome Project

- Proteomics market currently $4 Billion and growing rapidly (~20% annually)

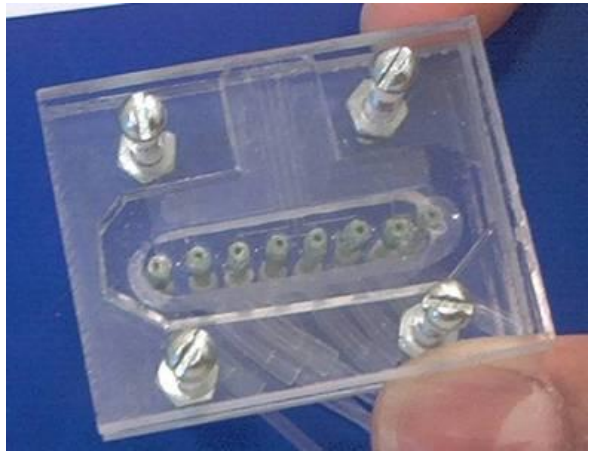
- Map the proteins of the body (>100,000) and study their interactions

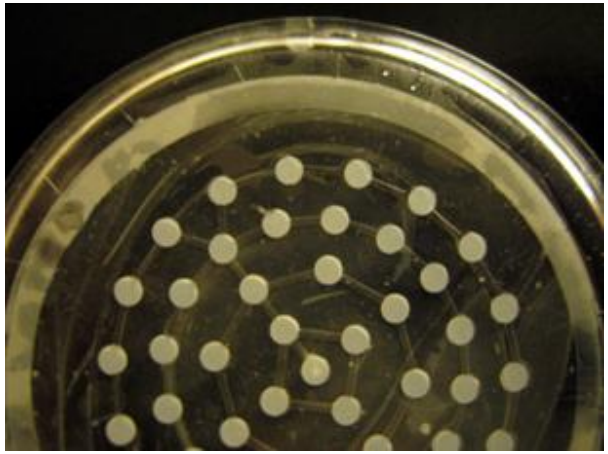


New cures for cancer, HIV, diabetes, etc.

Technology Overview: Microfluidic Solutions

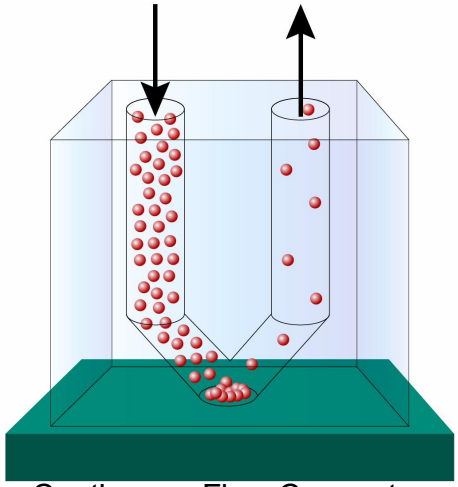
- Problems
  - Current microarray tools produce poor quality spots
  - DNA extraction and amplification expensive and challenging
  - Combining PCR and sensors difficult





A Simple, Innovative Solution: The Continuous Flow Microspotter™ (CFM)

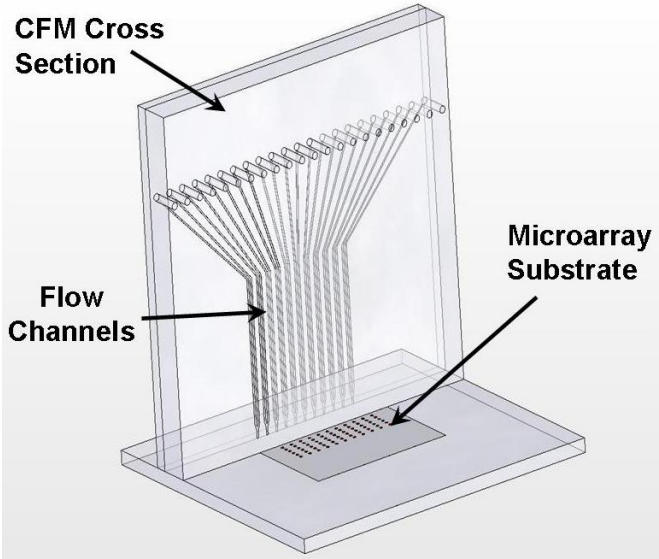
- Deposits high quality protein microspots by flowing the solution over a surface
- Patent-pending
- 86 fold (8,500%) concentration improvement over current technologies
- Speeds discovery of new drug therapies
  - Cancer, HIV, Diabetes, etc.



Continuous Flow Concept

Business Proposition

- Materials and Labor: $50/unit
- Unit Price: $15,000
- Replacement Market: 8,000 units/yr
- Projected Sales: 250 (Y1) to 1,400 (Y5)



Cross Section of Multi-spot CFM Print Head

Problems with Protein Microarrays

- **Borrowed technology**
- **Poor spot concentration**
- **Irregular results**
  - Cross contamination, variable spot size, background noise
- **Drying of the spot**
  - Proteins become dysfunctional
- **Extremely fragile**
- **Total instrument cost**
  - **$50k and up**

The CFM: A Novel Solution

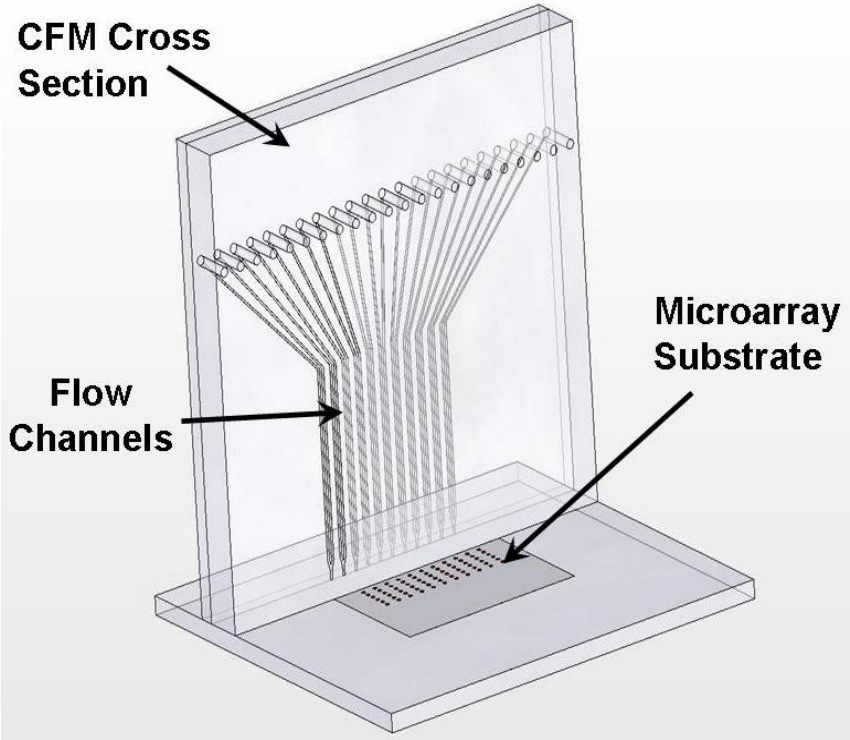
- **Developed for proteins**
- **Higher spot concentration**
- **Complete spot isolation**
  - No cross contamination, less background noise, no drying
- **Inexpensive, durable material**
- **Flexible design process**
  - **Rapid prototyping**
  - **Scalable production**
  - **Off-the-shelf manufacturing equipment**

Additional Spotter Competitive Advantages

- Specifically developed for deposition of proteins on SPR chips (BiaCore)
  - SPR interface technology (4 spots to 400!)
- Applicable to: proteins, DNA, cells, sugars, lipids
  - Only technique currently capably of spotting lipids well
- Chemistry on a chip and multiple layers!
  - Sensor and assay development

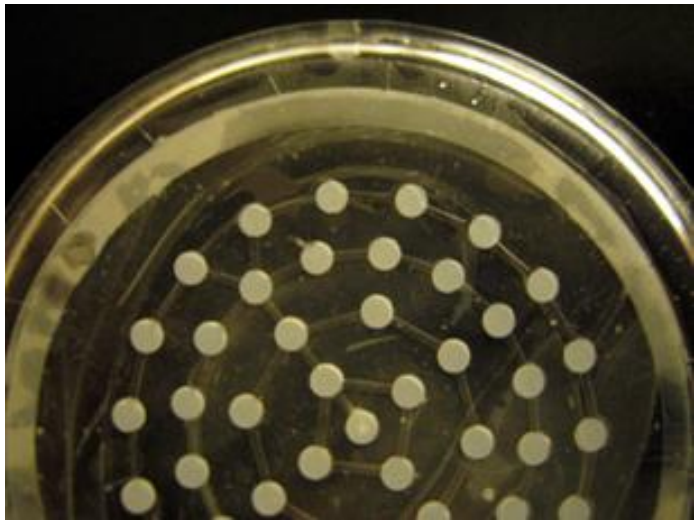
Strategy Overview

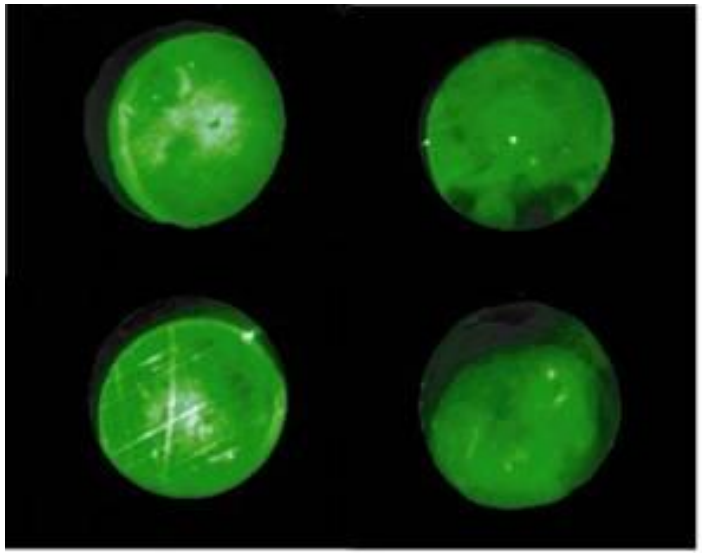
- **Products**
  - Simple handheld spotter, late 2005
  - Protein CFM compatible with commercial spotters, mid 2006
- **Price**
  - Handheld $4,000
  - Printhead $15,000
- **Positioning**
  - Academic markets
  - Commercial markets
- **Future markets**
  - Lipid and sugar CFMs
  - Cell culture and testing
  - Multistep assays



DNA Extraction and Amplification

- Uses patented AlOx membrane
  - License negotiation with Anzen Bio (Gary Crocker)
- Implementing membrane in microfluidic system with PCR
- Requires optics and microfluidics
- Expected first product 1-2 years
- Designed to move genomics and diagnostics to hospital labs
  - $Multi - Billion dollar opportunity
- Applications: biowarfare, food safety, environmental monitoring, etc





Upcoming Milestones

- Spotter
  - Handheld system (Fall 2005)
  - Demonstrate spotter with cells, sugars, and lipids (Winter 2005-06)
  - Integrate with commercial spotter - complete basic system (Spring 2006)
  - 1000 spot prototype (Summer 2006)
- DNA Extraction
  - Simultaneous extraction 100 DNA samples (Summer 2005)
  - Integrated PCR on membrane (Fall 2005)
  - Integrated detection on membrane (Winter 2005)
  - Complete extraction, amplification, and detection system on 1 channel (Spring 2005)

Personnel

- Dr. Bruce Gale, PI
- Collaborators
  - Dr. David Myszka, Spotter Development
  - Dr. Carl Wittwer, DNA Melting Arrays
  - Dr. Karl Voelkerding, DNA Extraction
- Dr. David Chang-Yen, Post-doc
- Josh Eckman, Business Development
- Several graduate students
- Business Advisory Panel
  - Volunteers would be greatly appreciated!
- Need more!

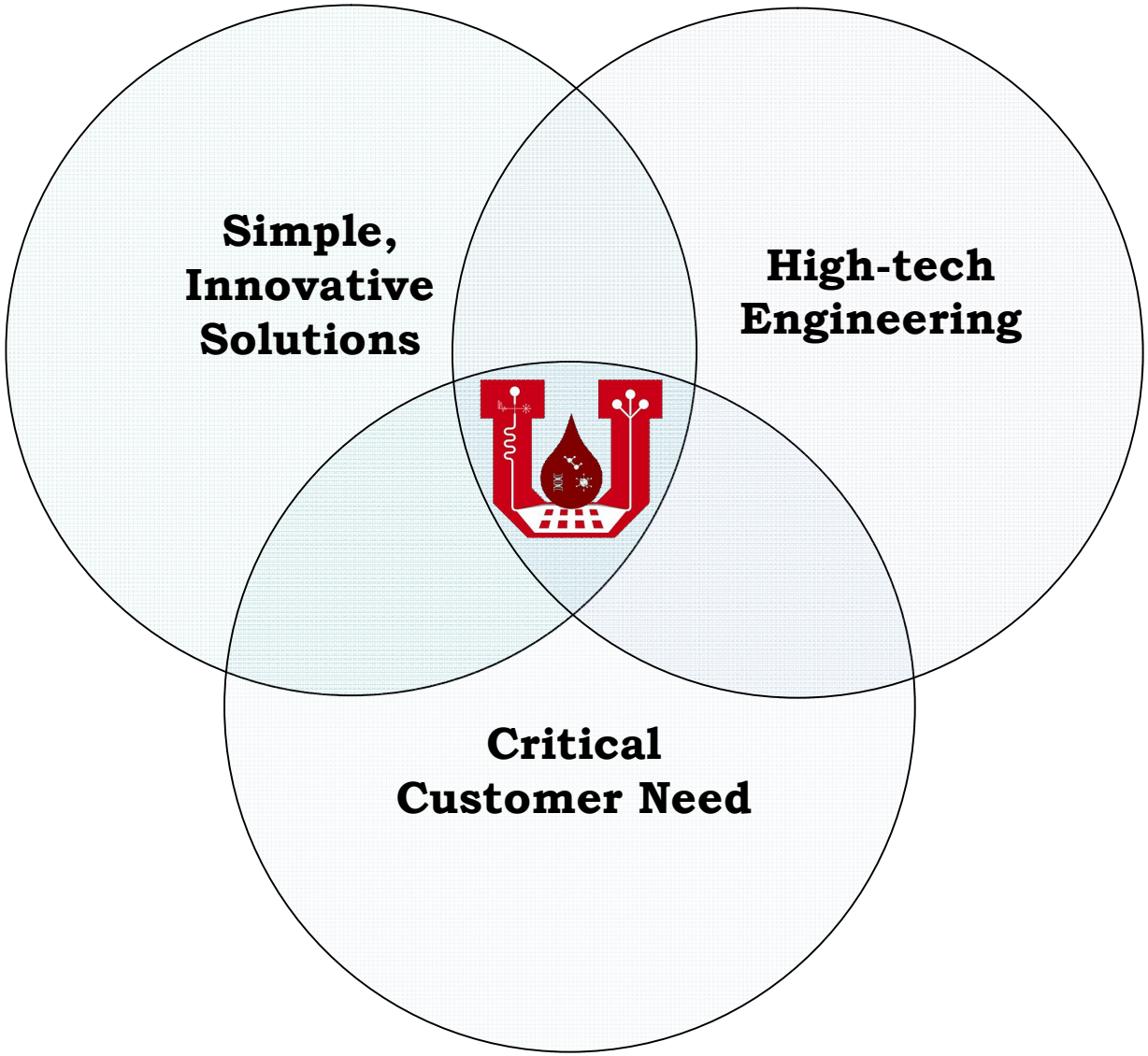
Commercialization Strategy

- Partner with local industry if possible
- License to others
- Start ups if needed
  - Wasatch Microfluidics

Technology	Companies Interested in Technology
1. Protein spotter	Wasatch Microfluidics, BioMicro, Idaho Technologies, BiaCore, many others
2. DNA extraction	Anzen Bio, ARUP, Idaho Technologies
3. DNA melting assays	Idaho Technologies
4. Micropumps	Invensys, Sorenson Medical, Ceramatec

Other Funding from: NSF, U of U

Conclusion


Simple,
Innovative
Solutions
High-tech
Engineering
Critical
Customer Need